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Whole Networks versus Inter-organizational Systems: Exploring Common Ground for US E-prescribing

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ABSTRACT

Healthcare networks driven by technology, such as e-prescribing, play an increasing role in care coordination. These networks are a mix of public and private entities whose governance and performance have only recently been studied. Given the critical role these networks play, their structure and governance need to be better understood to achieve expected network performance. The inter-organizational information system literature has begun shifting its focus beyond enterprises to inter-organizational transactions (e.g., supply chain). At the same time, the public administration literature has grasped upon the governance of whole networks but has not embraced the implications of technology. This study seeks to describe the ambulatory e-prescribing network in the United States by drawing upon both literatures. One of the key challenges identified is the necessity of multi-level analysis and performance measures.

Keywords

Whole network, Inter-organizational System, E-prescribing, Healthcare IT, Organizational Design

INTRODUCTION

The push towards affordable care in the United States has increased the role of care coordination using computer-mediated networks. These might be accountable care organizations (Weeks, Gottlieb, Nyweide, Sutherland, Bynum, Casalino, Gillies, Shortell and Fisher, 2010), hospital physician networks (Lindenauer, Remus, Roman, Rothberg, Benjamin, Ma and Bratzler, 2007), personal health records (Pirtle and Chandra, 2011), health information exchanges (Adler-Milstein, Bates and Jha, 2011), or national systems like e-prescribing (New England Healthcare Institute, 2009). These networks are increasingly a mix of public and private entities which have received little attention (Provan and Kenis, 2008).

Frameworks for studying public/private healthcare networks from an information systems perspective are limited. Inter-organizational systems (IOS) focus on private sector firms that support businesses (e.g., Boonstra and de Vries, 2005; Warkentin, Bapna and Sugumaran, 2001). An IOS may provide business services like supply chain (Boonstra and de Vries, 2008; Fearon, Ballantine and George, 2010; Kuo, Smits and Chen, 2005), automotive industry ordering (Howard, Vidgen and Powell, 2003), government services (Ponisio, Sikkil, Riemens and Eck, 2007), and electronic trading (Fearon et al., 2010). IOS studies do exist in healthcare such as emergency services (Horan and Schooley, 2005), telemedicine (Garfield, Kamis and LeRouge, 2004), drug use management (Pouloudi and Whitley, 1997), provisioning (purchase of services) in Scotland (Spinardi, Graham and Williams, 1997), and pharmaceutical wholesaling in Australia (Reimers, Johnston and Klein, 2010).

The organizational sciences also study networks but more from a public administration orientation. Recent research in this literature examined a national payment network (Croteau and Dubsy, 2011), criminal justice initiatives (Pardo, Gil-Garcia and Burke, 2008), emergency management (Marich, Horan and Schooley, 2008; Vogt, Hertweck and Hales, 2011), and healthcare (Bygstad and Hanseth, 2010; Sulistyo, 2009; Wiggins, Pumphrey, Beachboard and Trimmer, 2006).

This research-in-progress paper seeks to explore common ground between IOS concepts in the IS literature and the whole network concepts in the public administration literature. Gaining a common framework may help us understand the performance of computer-mediated healthcare networks necessary for care coordination. Networks in public administration are defined as “groups of three or more legally autonomous organizations that work together to achieve not only their own goals but also a collective goal (Provan et al., 2008, p. 231).” Working together goes beyond the collaboration among network actors but also includes the governance of the network. This means the information systems linking network participants together must consider both operational and network implications.

Two research questions are explored with “concepts” referring to those drawn from the IOS and whole network literature. First, how would a national public/private network like e-prescribing be characterized using these concepts? Second, what concepts would help describe the performance of a national public/private network like e-prescribing?

The paper begins with a brief comparison of theoretical concepts from both IOS and public administration network literature. The concept of network performance is also introduced. The methods section describes the narrative summary method for analyzing the US e-prescribing network. The case description includes both the manual prescribing network and the current e-prescribing network. The whole network analysis section is a cross-case comparison of the two networks. The paper concludes with a discussion of the common ground that exists between the IOS and public administration literatures.

THEORETICAL FRAMEWORK

The IOS and whole network literatures have traditionally examined different problems. IOS research seeks to identify the impact of information technology on business organizations (Eom, 2005b). The whole network literature focuses on multi-organizational governance to produce network-level outcomes (Provan et al., 2008). However, both literatures seek ways to manage interdependence amongst the involved organizations. In addition, IOS studies are moving towards broader networks beyond the enterprise and whole network studies are moving from public to public/private computer-mediated networks. This paper takes the first step in identifying common ground between these fields of study. The section begins with describing the orientation of IOS literature followed by that of whole networks. The framework section closes by introducing the notion of network performance rather than just IOS effectiveness.

Inter-Organizational System (IOS)

Eom (2005a) examined the foundational concepts and the information technology infrastructure of IOS. After reviewing several definitions, Eom (2005b, p. 4) defined IOS as:

An inter-organizational system (IOS) is an information and management system that transcends organizational boundaries via electronic linkages with its trading partners to share data, information, and business applications, provide the capability of electronic transactions including buying and selling goods and services, and facilitate communications and decision making for the purpose of increasing efficiency, effectiveness, competitiveness, and profitability for participating organizations. The electronic linkage is established by the internet, extranets, intranets, groupware, electronic data interchange (EDI), workflow systems, mobile communication technologies, and other information and communication technologies.

Studies in IOS see the system as coordinating transactions with an impact on cooperation (Fearon et al., 2010), concentration of benefits impacting adoption (Borman, 2006), insufficient power base to implement strategy (Spinardi et al., 1997), long-term relationships (Hsin-Wei, 2010), integration options (Goethals, Snoeck and Lemahieu, 2011), interaction of contractual and relational mechanisms (Roehrich and Lewis, 2010), power and interests (Boonstra et al., 2005; 2008), strategy and IOS effectiveness (Nakayama and Sutcliffe, 2005), and implementation barriers erected by stakeholders (Howard et al., 2003).

Most IOS studied are concentrated around key players that receive much of the benefits, such as an enterprise that sets up a network with suppliers (Borman, 2006). However, the focus of information systems is shifting from the internal to external (Daniel and White, 2005). Borman (2006) argues that to “open up” these technologies to a broader set of participants (e.g., like ATMs in banking) the capabilities of IOS need to be limited. He uses the term “IOS as infrastructure” to suggest that organizations should limit the encroachment of an IOS on their own unique resources. This viewpoint is in opposition to those who argue that IOS needs more functionality to have broader appeal (e.g., Dai and Kauffman, 2002). This debate highlights one challenge of using an IOS framework to study public/private national networks like e-prescribing.

Whole Networks

Whereas the information system is the locus of attention in IOS, whole network studies rooted in public administration have an organizational governance slant. A whole network represents “consciously created forms of social organization whose members strive to achieve common goals (Raab and Kenis, 2009, p. 205)”. Provan and Kenis (2008) point to the absence in the organizational sciences literature on network governance which whole network studies seek to address. Most network studies are about an organization or an organizational dyad within a network (Provan, Fish and Sydow, 2007). They point out that networks are comprised of autonomous organizations relying upon cooperation of its members not just the linkages between these members (e.g., network density). They go on to say “some form of governance is necessary to ensure that participants engage in collective and mutually supportive action, that conflict is addressed, and that network resources are acquired and utilized efficiently and effectively (Provan et al., 2008, p. 231)”. Since most public networks are moving towards computer mediation, some overlap exists with externally-oriented IOS.

Network researchers in public administration pay attention to form (Kenis and Provan, 2009) and governance (Provan et al., 2008). The three identified forms of public networks are shared governance, lead organization, and network administrative

organization (NAO) (Provan et al., 2008). The egalitarian form of a network is shared governance with no organization in charge which is a form found to be problematic in healthcare (Akhlaghpour, 2008; Bygstad et al., 2010; Spil and Salmela, 2007). The lead organization within a participant-governed network takes on a highly centralized broker role such as a hospital-physician network. The roles might be split (partial broker) when several lead organizations exist. The NAO form is externally governed with the broker imposing standards and technologies top-down and providing incentives to use the infrastructure (Provan et al., 2008). The NAO broker doesn't provide the same service as the other network members do. These forms described by Provan and Kenis (2008) can be placed into a governance typology by the degree of centralization and locus of governance (Table 1).

	Locus of Governance	
Degree of Centralization	Participant-governed	Externally-governed
No broker	Shared governance	
Partial broker	Some centralized roles – others distributed	
Brokered	Lead organization	Network administrative organization

Table 1. Forms of Network Governance

Network Performance

While there is some movement in IOS studies towards looking beyond the enterprise (Daniel et al., 2005), most IOS studies still focus on the dominant firm and the technology itself (Reimers, Johnston and Klein, 2004). Few IOS studies look at the social and technical variables of collective action (Reimers et al., 2004). In contrast, whole network studies deliberately concern themselves with the collective goods produced (Provan et al., 2008; Raab et al., 2009; Wiggins et al., 2006). Different strategic orientations in network coordination are related to different network objectives (Herranz Jr, 2010). Network performance must also address situations where responsibilities are distributed across multiple agencies (Kenis et al., 2009). While these agencies (or groups of network members) may provide excellent services individually, there is no guarantee the network performs well (Provan and Milward, 1995) and presumably vice versa.

One area of commonality between IOS and whole networks is that benefits generally accrue to the dominant party (Borman, 2006; Tapscott, Lowy and Ticoll, 2000). For most networks, members inevitably look out for their own interests so a broker is generally necessary (Provan et al., 1995; van Raaij, 2006). Thus network performance needs a collective measure such as the one by Provan et al. (2008, p. 229): “the attainment of positive network level outcomes that could not normally be achieved by individual organizational participants acting independently”.

Multi-level criteria seem necessary to address the complexity of evaluating the performance of a network. Both the IOS and whole network literature argue against an individual organization as the unit of analysis (e.g., Lyytinen and Damsgaard, 2001; Provan et al., 2007). The effectiveness of a network depends on the extent control mechanisms are applied in the production of collective goods (Raab et al., 2009). There are also institutional factors that have implications on diffusion path (Lyytinen et al., 2001; Reimers et al., 2004).

Several healthcare examples illustrate the move towards a network orientation. In terms of measurement, Kim and Burns (2007) found that success factors for collaboration in Korean hospitals had less to do with the hospitals than network process. Reimers et al. (2010) described how two IOS took different paths to diffusion. The first was the Australian pharmaceutical industry whose wholesalers began with proprietary systems and moved towards an open system where pharmacies could easily order from different wholesalers. They also describe a reverse auction e-marketplace that morphed into an electronic ordering facility in a Chinese province.

METHODOLOGY

Researchers in whole network analysis contend that only portions of a network are ever looked at. The expanse of most whole networks (dozens if not thousands of members) makes it difficult to study in-depth. Most organizational scholars have refrained from the risky endeavor of collecting whole network data and focus instead on a dyadic relationship within a network (Provan et al., 2007; Provan et al., 2008; Raab et al., 2009). There are also multiple structural levels of network effectiveness to be considered (Provan and Milward, 2001). The study uses Yin's (2003) comparative method for reporting a case study. While Yin (2003) advocates multiple data sources, including quantitative data, the presumption is the data

collected by a research team not by others (Baxter and Jack, 2008). A synthesis tells a systematic story that draws upon all forms of research designs including randomized controlled trials and observational studies (Popay, Roberts, Sowden, Petticrew, Arai, Rodgers and Britten, 2006), which may not be the work of the researchers. This research synthesis seeks to utilize the wealth of narrowly focused quantitative and/or qualitative studies that surrounds e-prescribing (one of many fields of study in medication management) by connecting them pragmatically into a “reasonable representation” (e.g., network representation) to explore underlying phenomena (Rousseau, Manning and Denyer, 2008).

Narrative summary is one of many synthesis methods that are used in specific research scenarios (see comparisons by Barnett-Page and Thomas, 2009; Dixon-Woods, Agarwal, Jones, Young and Sutton, 2005). Narrative summary falls within the broader class of narrative synthesis methods (Popay et al., 2006) with an orientation towards data analysis rather than theory development. Dixon-Woods et al. (2005, p. 47) describe the method as:

“typically involves the selection, chronicling, and ordering of evidence to produce an account of the evidence. Its form may vary from the simple recounting and description of findings through to more interpretive and explicitly reflexive accounts that include commentary and higher levels of abstraction”.

Examples of narrative summary in healthcare include the study of social care provision (Allen and Rixson, 2008) and the dissemination of innovation in health care practices (Greenhalgh, Robert, Bate, Macfarlane and Kyriakidou, 2007).

This study followed the narrative synthesis sequence of steps recommended by Popay et al. (2006):

	What is done	Study Specifics
1	Identifying the review focus, searching for and mapping the available evidence.	Over 400 published resources were used with 72% from academic journals including 45% from pharmacy journals which have been the traditional source of studies on prescribing, formulary adherence, and error rates.
2	Specifying the review question.	Example: e-prescribing studies have not looked at the intermediary as a broker.
3	Identifying studies to include in the review.	Data sources that speak to coordination between organizations but also the broker's role in developing standards, certifying software vendors, and reporting network outcomes (e.g., adoption rates).
4	Data extraction and study quality appraisal.	Snowballing used to avoid reliance on sampling the literature (Rousseau et al., 2008). Classification of articles by topic and discipline (e.g., medicine or pharmacy)
5	Synthesis. Chronicling and ordering the evidence.	Prior work looked at information architectures, process, roles and role interactions. Current work looks at network relationships.
6	Reporting the results of the review and dissemination.	Network actors, relationships, and organization.

Table 2 Steps for Narrative Synthesis

CASE DESCRIPTION

Ambulatory (outpatient) e-prescribing in the US attempts to computer-mediate what was a predominantly manual process between outpatient prescribers, patients, payers and pharmacies. If fully deployed, e-prescribing embodies a transaction-driven public-private network whose members would encompass upwards of 250,000 locations around the country. When the pilot studies were conducted in 2006, there were 206,157 medical practices (Anderson, 2007) and 58,355 pharmacy locations (SK&A Healthcare Information Solutions, 2007). This network dispensed 3.9 billion prescriptions in 2009 (Surescripts, 2010).

Manual Prescribing

The heart of manual prescribing is a triad of network members who jointly complete a transaction. The prescriber hands the paper prescription to a patient signaling the termination of the visit (Flynn, Barker and Carnahan, 2003; Hunt, Siemencuk and Koch, 2008). The patient is the decision-maker who determines when (if at all) and where the prescription will be filled. The prescriber has no direct involvement in filling a prescription except if a pharmacy cannot resolve any discrepancies with the prescriber's medical staff (Barich, 2007; Hansen, Fernald, Araya-Guerra, Westfall, West and Pace, 2006). This triadic relationship is shown on the left side of Figure 1. The triad changes with each transaction (different combination of patient,

physician, pharmacist). While not shown on the figure, the pharmacy adjudicates a medication claim with a pharmacy benefit manager (PBM) using long-established electronic connections (not shown).

E Prescribing

The e-prescribing network processes an electronic prescription (e-script) for a single medication. The e-transaction begins with a physician in a medical practice that generates the e-script using software provided by a vendor. The e-prescribing software transmits the e-script to any participating pharmacy in the network via the network intermediary (i.e., Surescripts). Nationwide e-prescribing would not have been possible without the creation of the Surescripts network linking medical practices, pharmacies, and payers (King, Christie and Alami, 2007). A pharmacy receives the e-script via its pharmacy management software. These relationships are shown on the right side of Figure 1. While the pharmacy still adjudicates a medication claim in the past, the e-prescriber is now connected to the PBM via Surescripts (not shown) in order to select less expensive generic medications and eliminate prescribing errors prior to transmission (e.g., pre-adjudication). E-prescribing changes the allocation of roles and responsibilities among members of the network triad found in manual prescribing (King and Azad, 2010).

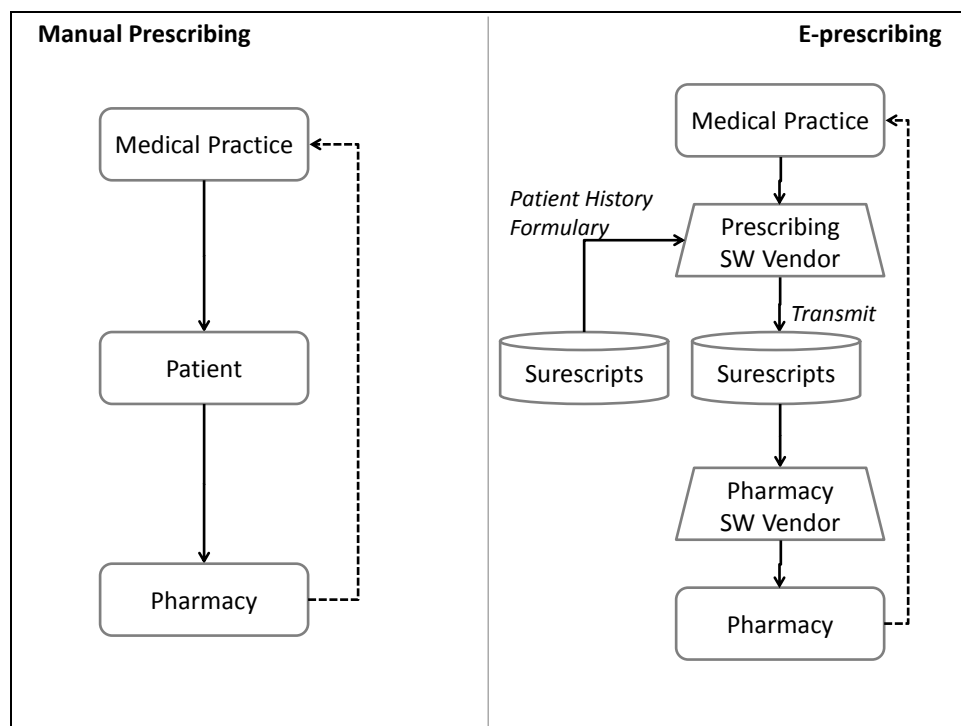


Figure 1 Transitive Triad of Prescribing Networks

WHOLE NETWORK ANALYSIS OF E-PRESCRIBING

The classification of network form, the first research question, can be determined from the concepts in Table 1 and prior architecture analysis (King et al., 2007). Every member of the manual network (medical practice, patient, pharmacy) directly participated in the transaction (filling a prescription). There are of course payers and regulatory bodies who set the parameters for writing and dispensing a prescription. However, the actual transaction is participant-driven. In contrast, e-prescribing introduces intermediation at both the level of software vendor and the intermediary who passes the prescription among network members (King et al., 2007). Surescripts serves as the broker for both the electronic pass-through (transmit) between medical practice and pharmacy but also as the certification body which software vendors must pass through to gain access to the network. Once electronic linkages are necessary, no single member (especially small medical practices and independent pharmacies) has the resources to provide the infrastructure. Thus, Surescripts is a broker who has no direct involvement in the collaborative transaction (i.e., externally governed network). Note that prescriptions can still be written

and filled without software that connects to Surescripts. This is the rationale for classifying e-prescribing as a network administrative organization (NAO).

Some tentative observations are made on network performance to address the second research question. E-prescribing introduces computer-mediation to transmitting a prescription so progress towards adoption becomes an important measure. The NAO (e.g., Surescripts) publicizes progress by reporting % physicians e-prescribing, % pharmacies able to receive e-scripts, and % e-scripts of total eligible (Surescripts, 2010). However, these measures don't directly address the reduction of medication errors through a knowledge-based information system (Kohn, Corrigan and Donaldson, 1999) which was the impetus for building this e-prescribing network. In fact, early adopter e-prescribers don't trust the patient history and formulary information being provided (Crosson, Schueth, Isaacson and Bell, 2012). Medication errors only decrease if full functionality has been adopted (Nanji, Rothschild, Salzberg, Keohane, Zigmont, Devita, Gandhi, Dalal, Bates and Poon, 2011) which is not the case today. Furthermore, the broker doesn't measure (or report) the extent of functionality used to generate each e-script and determine its impact on error rates. Such analysis must be done independently on very small samples with respect to the size of the network (e.g., Dainty, Adhikari, Kiss, Quan and Zwarenstein, 2011). Network performance measures need to address the output of the system such as errors reaching the patient and less emphasis on who makes the error (prescriber or pharmacist). Alternatively, an assessment of the value added at each step would provide a better network measure.

Measure	Manual Prescribing	E-prescribing
Network Form for Transaction	No formal governance for transmit and error-check; brokered for adjudication (e.g., PBM)	Network administrative organization
Computer mediation	Adjudication at dispensing	Generation of e-script, pre-adjudication, transmission; adjudication at dispensing
Operating Model	Error-check at dispensing	Error-check at point of prescribing
Performance Measure (safety)	Errors that reach patient	Prescribing errors at dispensing, prescribing of generics (formulary adherence)
Performance Measure (adoption)	n/a	% physicians e-prescribing; % pharmacies able to receive e-scripts; % e-scripts of total eligible

Table 3. Network Comparison

A comparison of the pre-existing (manual) network and e-prescribing highlights the change in network form (Table 3). E-prescribing adds a broker, additional computer-mediation whose infrastructure needs to be governed, and changes the point of error-checking. Unfortunately, no easily measureable network performance measures exist in either network form.

DISCUSSION AND CONCLUDING REMARKS

Some of the basic issues facing studies of whole networks were found to exist in this description of e-prescribing. Foremost among them are the characterization of the network and how measures of network performance are different than organization performance. Given the prominent role of the US government through its use of Medicare e-prescribing incentives and penalties (Centers for Medicare & Medicaid Services, 2011), e-prescribing has a strong public element. That e-prescribing can be characterized as an NAO means that the notions of network governance from public administration literature can be brought to bear. For example, Provan and Kenis (2008, p. 231) say "a focus on governance involves the use of institutions and structures of authority and collaboration to allocate resources and to coordinate and control joint action across the network as a whole". The adoption of e-prescribing as a technology should be viewed from both an organizational perspective (e.g., network governance) but also technology (e.g., IT governance).

With regards to network performance, e-prescribing is no different than other networks. Its members, as autonomous organizations, must gain sufficient benefit to make adoption worthwhile (Borman and Ulbrich, 2011; Davidson and Bryant, 2002; Tapscott et al., 2000). At the same time, a network that adds value through the services provided depends upon mass adoption to be effective. Adoption rates have surged once Medicare incentives and penalties were imposed (Surescripts, 2010). However, one in four physicians did (would) not send ten e-scripts by mid-2011 (Centers for Medicare & Medicaid Services, 2011) despite the financial penalties being imposed on them for non-adoption. Further multi-level studies are needed at both a network and member level to determine the reasons why (Provan et al., 2001). Reimers et al (2010) from the IOS literature underscore this point: "certain theoretical commitments that underpin much existing inter-organisational

Information Systems (IOIS) research at small scales become untenable when IOIS are studied at the scale of whole industries and over time periods greater than individual implementation projects (p. 229).” These authors moved from the construction of discrete variables to a temporal practice-based constructs.

While exploring the reasons a network has been unable to meet its own adoption goals is a worthy pursuit, the bigger picture should also be kept in mind. E-prescribing in the US has been attempted for decades without success. Thus, Surescripts as an NAO has been able to accomplish much more than its predecessors. An NAO network with its centralized structure has higher performance than other network forms like shared governance and lead organizations (Herranz, 2010; Provan et al., 1995). However, to truly computer-mediate a healthcare network providing a collaborative e-prescribing service, further study is warranted. Perhaps the most daunting question of practice should be asked: Does the performance of a network matter more than those providing a particular component of service (e.g., Provan et al., 2001)? If so, due consideration of additional network-based incentives and cost-sharing would be a first step.

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REFERENCES

1. Adler-Milstein, J., Bates, D. W. and Jha, A. K. (2011) A Survey of Health Information Exchange Organizations in the United States: Implications for Meaningful Use, *Annals of Internal Medicine*, 154, 10, 666-671.
2. Akhlaghpour, S. (2008) Impacts Of Social Embeddedness On IOS Planning Effectiveness: A Multilevel Perspective, In *Annual Conference of the Administrative Sciences Association of Canada*, Halifax, Nova Scotia.
3. Allen, D. and Rixson, L. (2008) How has the impact of ‘care pathway technologies’ on service integration in stroke care been measured and what is the strength of the evidence to support their effectiveness in this respect?, *International Journal of Evidence-Based Healthcare*, 6, 1, 78-110.
4. Anderson, M. R. (2007) AC Group’s 2007 Annual Report: The Digital Medical Office of the Future Computer Systems for the Physician’s Office, AC Group, Inc.
5. Barich, D. P. (2007) Pilot Testing of Electronic Prescribing Standards, Centers for Medicare & Medicaid Services.
6. Barnett-Page, E. and Thomas, J. (2009) Methods for the synthesis of qualitative research: A critical review, *BMC Medical Research Methodology*, 9, 1, online.
7. Baxter, P. and Jack, S. (2008) Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers, *Qualitative Report*, 13, 4, 75-92.
8. Boonstra, A. and de Vries, J. (2005) Analyzing Inter-Organizational Systems from a Power and Interest Perspective, *International Journal of Information Management*, 25, 6, 485-501.
9. Boonstra, A. and de Vries, J. (2008) Managing stakeholders around inter-organizational systems: A diagnostic approach, *The Journal of Strategic Information Systems*, 17, 3, 190-201.
10. Borman, M. (2006) Developing, and testing, a theoretical framework for inter-organisational systems (IOS) as infrastructure to aid future IOS design, *Information Systems and E-Business Management*, 4, 4, 343-360.
11. Borman, M. and Ulbrich, F. (2011) Managing Dependencies in Inter-Organizational Collaboration: The Case of Shared Services for Application Hosting Collaboration in Australia, In *2011 44th Hawaii International Conference on System Sciences*, 4-7 Jan. 2011, 1-10.

12. Bygstad, B. and Hanseth, O. (2010) IT Governance through Regulatory Modalities. Health Care Information Infrastructure and the “Blue Fox” Project, In Kautz, K. and Nielsen, P. A. (Eds.) *Scandinavian Information Systems Research*, Vol. 60, Springer Berlin Heidelberg, 50-64.
13. Centers for Medicare & Medicaid Services (2011) Medicare Program; Proposed Changes to the Electronic Prescribing (eRx) Incentive, Department of Health and Human Services.
14. Crosson, J. C., Schueth, A. J., Isaacson, N. and Bell, D. S. (2012) Early Adopters of Electronic Prescribing Struggle to Make Meaningful Use of Formulary Checks and Medication History Documentation, *The Journal of the American Board of Family Medicine*, 25, 1, 24-32.
15. Croteau, A. M. and Dubsky, J. (2011) Uncovering Modes of Interorganizational Governance of IT, In *Hawaii International Conference on System Sciences*, 4-7 Jan. 2011, 1-10.
16. Dai, Q. and Kauffman, R. J. (2002) Business Models for Internet-Based B2B Electronic Markets, *International Journal of Electronic Commerce*, 6, 4, 41-72.
17. Dainty, K. N., Adhikari, N. K. J., Kiss, A., Quan, S. and Zwarenstein, M. (2011) Electronic prescribing in an ambulatory care setting: a cluster randomized trial, *Journal of Evaluation in Clinical Practice*, online.
18. Daniel, E. M. and White, A. (2005) The Future of Inter-Organisational System Linkages: Findings of an International Delphi Study, *European Journal of Information Systems* 14, 2, 188-203.
19. Davidson, S. J. and Bryant, D. M. (2002) B2B exchanges: lessons from the trading pit, *Journal of International Law*, 5, 10, 1-10.
20. Dixon-Woods, M., Agarwal, S., Jones, D., Young, B. and Sutton, A. (2005) Synthesising Qualitative and Quantitative Evidence: A Review of Possible Methods, *Journal of Health Services Research & Policy*, 10, 1, 45-53.
21. Eom, S. B. (Ed.) (2005a) *Inter-Organizational Information Systems in the Internet Age*, Idea Group Inc (IGI).
22. Eom, S. B. (2005b) An Introduction to Information Systems with Selected Biography, In Eom, S. B. (Ed.) *Inter-Organizational Information Systems in the Internet Age*, Idea Group Inc (IGI), 1-30.
23. Fearon, C., Ballantine, J. and George, P. (2010) Understanding the role of electronic trading and inter-organisational cooperation and coordination, *Internet Research*, 20, 5, 545-562.
24. Flynn, E. A., Barker, K. N. and Carnahan, B. J. (2003) National Observational Study of Prescription Dispensing Accuracy and Safety in 50 Pharmacies, *J Am Pharm Assoc*, 43, 2, 191-200.
25. Garfield, M. J., Kamis, A. A. and LeRouge, C. M. (2004) Champion Networks In Federated Interorganizational Systems: Case Studies In Telemedicine, *Communications of the Association for Information Systems*, 14, 596-615.
26. Goethals, F. G., Snoeck, M. and Lemahieu, W. (2011) Options in inter-organizational systems integration, *Systèmes d'Information et Management*, 16, 3, 1-26.
27. Greenhalgh, T., Robert, G., Bate, P., Macfarlane, F. and Kyriakidou, O. (2007) *Diffusion of Innovations in Health Service Organisations*, Blackwell Publishing Ltd.
28. Hansen, L. B., Fernald, D., Araya-Guerra, R., Westfall, J. M., West, D. and Pace, W. (2006) Pharmacy Clarification of Prescriptions Ordered in Primary Care: A Report from the Applied Strategies for Improving Patient Safety (ASIPS) Collaborative, *Journal of the American Board of Family Medicine* 19, 1, 24-30.
29. Herranz, J. (2010) Multilevel Performance Indicators for Multisectoral Networks and Management, *The American Review of Public Administration*, 40, 4, 445-460.

30. Herranz Jr, J. (2010) Network Performance and Coordination: A Theoretical Review and Framework, *Public Performance & Management Review*, 33, 3, 311-341.
31. Horan, T. A. and Schooley, B. (2005) Inter-organizational Emergency Medical Services: Case Study of Rural Wireless Deployment and Management, *Information Systems Frontiers*, 7, 2, 155-173.
32. Howard, M., Vidgen, R. and Powell, P. (2003) Overcoming Stakeholder Barriers in the Automotive Industry: Building to Order with Extra-Organizational Systems, *Journal of Information Technology (Routledge, Ltd.)*, 18, 1, 27.
33. Hsin-Wei, W. (2010) The determinants of long-term relationship on inter-organizational systems performance, *The Journal of Business & Industrial Marketing*, 25, 2, 106-118.
34. Hunt, J. S., Siemieniuk, J. and Koch, C. (2008) Physicians Perspectives on Physician Drug Dispensing Using a Qualitative Focus Group Methodology, *Journal of Pharmaceutical Finance, Economics & Policy*, 16, 4, 57-66.
35. Kenis, P. and Provan, K. G. (2009) Towards an Exogenous Theory of Public Network Performance, *Public Administration*, 87, 3, 440-456.
36. Kim, K.-J. and Burns, L. R. (2007) Success factors in hospital network performance: evidence from Korea, *Health Serv Manage Res*, 20, 3, 141-152.
37. King, N. and Azad, B. (2010) A Synthetic Representation of Inter-Organizational Multi-Actor Collaborative Structures: A Pragmatic Look at US E-Prescribing, In *2010 AIS SIGPrag Event at ICIS 2010 in St. Louis*, December 15.
38. King, N., Christie, T. and Alami, K. M. (2007) Process Implications of E-prescribing Information Integration Models: United States versus a Middle East Approach, *E-service Journal*, 5, 3, 15-38.
39. Kohn, L. T., Corrigan, J. M. and Donaldson, M. S. (Eds.) (1999) *To Err Is Human: Building a Safer Health System*, National Academy Press, Washington, DC.
40. Kuo, D., Smits, M. T. and Chen, W. H. (2005) SME-based collaborative supply chain management: The impact of information technologies, *International Journal of Management and Enterprise Development*, 2, 3-4, 360-373.
41. Lindenauer, P. K., Remus, D., Roman, S., Rothberg, M. B., Benjamin, E. M., Ma, A. and Bratzler, D. W. (2007) Public Reporting and Pay for Performance in Hospital Quality Improvement, *New England Journal of Medicine*, 356, 5, 486-496.
42. Lyytinen, K. and Damsgaard, J. (2001) What's Wrong with the Diffusion of Innovation Theory, *Proceedings of the IFIP TC8 WG8.1 Fourth Working Conference on Diffusing Software Products and Process Innovations*, Kluwer, B.V.
43. Marich, M. J., Horan, T. A. and Schooley, B. L. (2008) Understanding IT Governance within the San Mateo County Emergency Medical Service Agency, In Friedrich, F. and Walle, B. V. d. (Eds.) *5th International ISCRAM Conference*, May.
44. Nakayama, M. and Sutcliffe, N. G. (2005) Exploratory Analysis on the Halo Effect of Strategic Goals on IOS Effectiveness Evaluation, *Information & Management*, 42, 2, 275-288.
45. Nanji, K. C., Rothschild, J. M., Salzberg, C., Keohane, C. A., Zigmont, K., Devita, J., Gandhi, T. K., Dalal, A. K., Bates, D. W. and Poon, E. G. (2011) Errors associated with outpatient computerized prescribing systems, *Journal of the American Medical Informatics Association*, 18, 6, 767-773.
46. New England Healthcare Institute (2009) Remaking Primary Care: From Crisis to Opportunity, Josiah Macy, Jr. Foundation, United States.

47. Pardo, T. A., Gil-Garcia, J. R. and Burke, G. B. (2008) Governance Structures in Cross-Boundary Information Sharing: Lessons from State and Local Criminal Justice Initiatives, In *Hawaii International Conference on System Sciences, Proceedings of the 41st Annual*, 7-10 Jan. 2008, 211.
48. Pirtle, B. and Chandra, A. (2011) An Overview Of Consumer Perceptions And Acceptance As Well As Barriers And Potential Of Electronic Personal Health Records, *American Journal of Health Sciences*, 2, 2, 45-52.
49. Ponisio, M. L., Sikkil, K., Riemens, L. and Eck, P. v. (2007) Understanding Cooperation in Inter-organizational Systems, In *IADIS International Conference - e-Commerce*.
50. Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M. and Britten, N. (2006) Guidance on the Conduct of Narrative Synthesis in Systematic Reviews: A Product from the ESRC Methods Programme.
51. Pouloudi, A. and Whitley, E. A. (1997) Stakeholder Identification in Inter-Organizational Systems: Gaining Insights for Drug Use Management Systems, *European Journal of Information Systems*, 6, 1, 1-14.
52. Provan, K. G., Fish, A. and Sydow, J. (2007) Interorganizational Networks at the Network Level: A Review of the Empirical Literature on Whole Networks, *Journal of Management*, 33, 3, 479-516.
53. Provan, K. G. and Kenis, P. (2008) Modes of Network Governance: Structure, Management, and Effectiveness, *Journal of Public Administration Research and Theory*, 18, 2, 229-252.
54. Provan, K. G. and Milward, H. B. (1995) A Preliminary Theory of Interorganizational Network Effectiveness: A Comparative Study of Four Community Mental Health Systems, *Administrative Science Quarterly*, 40, 1, 1-33.
55. Provan, K. G. and Milward, H. B. (2001) Do Networks Really Work? A Framework for Evaluating Public-Sector Organizational Networks, *Public Administration Review*, 61, 4, 414-423.
56. Raab, J. and Kenis, P. (2009) Heading Toward a Society of Networks, *Journal of Management Inquiry*, 18, 3, 198-210.
57. Reimers, K., Johnston, R. and Klein, S. (2010) The Difficulty of Studying Inter-organisational IS Phenomena on Large Scales: Critical Reflections on a Research Journey, *Electronic Markets*, 20, 3-4, 229-240.
58. Reimers, K., Johnston, R. B. and Klein, S. (2004) The Shaping Of Inter-Organisational Information Systems: Main Design Considerations Of An International Comparative Research Project, In *17th Bled eCommerce Conference*, June 21 - 23.
59. Roehrich, J. and Lewis, M. (2010) Towards a model of governance in complex (product-service) inter-organizational systems, *Construction Management and Economics*, 28, 11, 1155-1164.
60. Rousseau, D. M., Manning, J. and Denyer, D. (2008) Chapter 11: Evidence in Management and Organizational Science: Assembling the Field's Full Weight of Scientific Knowledge Through Syntheses, *The Academy of Management Annals*, 2, 1, 475 - 515.
61. SK&A Healthcare Information Solutions (2007) Consumer Access to Pharmacies In the United States, 2007, Pharmaceutical Care Management Association (PCMA).
62. Spil, T. and Salmela, H. T. T. (2007) Inter Organizational Evaluation of SISP: What New Criteria Are Needed?, In *ECIS 2007 Proceedings*.
63. Spinardi, G., Graham, I. and Williams, R. (1997) EDI in the Scottish Health Service: inter-organisational systems and inter-organisational change, *The Journal of Strategic Information Systems*, 6, 3, 251-263.

64. Sulistyo, P. (2009) Inter-Organizational Strategic Information Systems Planning (IOSISP) in Network Perspective: How Network Governance Influences IOSISP Effectiveness Evaluation of Healthcare, Government and logistic/Transport Industry Sectors in the Netherlands, In: *Electrical Engineering, Mathematics and Computer Science*, University of Twente.
65. Surescripts (2010) 2009 Progress Report on E-Prescribing.
66. Tapscott, D., Lowy, A. and Ticoll, D. (2000) Digital Capital: Harnessing the Power of Business Webs, Harvard Business Press.
67. van Raaij, D. P. A. M. (2006) Norms Network Members Use: An Alternative Perspective for Indicating Network Success or Failure, *International Public Management Journal*, 9, 3, 249-270.
68. Vogt, M., Hertweck, D. and Hales, K. (2011) Strategic ICT Alignment in Uncertain Environments: An Empirical Study in Emergency Management Organizations, In *Hawaii International Conference on System Sciences*, 4-7 Jan. 2011, 1-11.
69. Warkentin, M., Bapna, R. and Sugumaran, V. (2001) E-Knowledge Networks for Inter-Organizational Collaborative E-Business, *Logistics Information Management*, 14, 1/2, 149-163.
70. Weeks, W. B., Gottlieb, D. J., Nyweide, D. J., Sutherland, J. M., Bynum, J., Casalino, L. P., Gillies, R. R., Shortell, S. M. and Fisher, E. S. (2010) Higher Health Care Quality And Bigger Savings Found At Large Multispecialty Medical Groups, *Health Affairs*, 29, 5, 991-997.
71. Wiggins, C., Pumphrey, L., Beachboard, J. and Trimmer, K. (2006) Entrepreneurial Governance in a Rural Family Practice Residency Program, In *Proceedings of the 39th Annual Hawaii International Conference on System Sciences*, 04-07 Jan. 2006, 97a-97a.
72. Yin, R. K. B. (2003) Case Study Research: Design and Methods, Sage Publications Inc.